

2003 South Dakota
Statewide Seatbelt Survey
Final Report

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Summary

A statewide observational survey of seatbelt use on South Dakota (SD) roads was conducted in June of 2003. Seatbelt use and other demographic data were recorded from 11,706 motorists traveling along a selected sample of SD roadways, which included rural and urban highways and interstates in 13 South Dakota counties. Data were recorded from all drivers, right front passengers of any age, and additional children under age 5 in the front or back seat. Results revealed that 63.2% of observed occupants were wearing a seatbelt or child restraint. When this percentage was weighted for road type and vehicle miles traveled at observation sites, the statewide estimate for seatbelt/child restraint use was 69.9%. This number compares with the statewide estimate of 64.0 % in the Summer 2002 survey, 63.3% in the Fall 2001 survey and 53.4% in the Fall 2000 survey.

The 2003 weighted statewide estimates for seatbelt use by road type were 68.6% for urban highways, 61.2% for rural highways, 75.9% for urban interstates, and 82.2% for rural interstates. In 2002 weighted statewide estimates for seatbelt use by road type were 60.0% for urban highways, 56.5% for rural highways, 75.7% for urban interstates, and 74.8% for rural interstates.

Based on unweighted seatbelt rates, the highest use rates were found in the counties of Minnehaha (80.4%), Union (77.0%), and Hughes (75.8%). Intermediate rates were observed in the counties of Lawrence (72.7), Pennington (67.0%), Brown (64.9%), and Fall River (60.1%). Lower rates were found in Davison (59.6%), and Beadle (55.4%). Small rural counties had the lowest rates: Kingsbury (48.6%), Charles Mix (48.1%), Grant (45.0%), and Tripp (36.8%). Seatbelt use rates in 8 of the 13 counties showed increases from the 2002 survey rates.

Unweighted seatbelt use rates varied by estimated age group of occupants. Of a small sample of 81 children who appeared to be under age 5, 70.4% were in some type of safety restraint, with 33.4% in a seatbelt only and 37.0% in a child restraint. The 2003 restraint usage (seatbelt or child restraint) use rate for 96 children judged to be 5 to 13 years old was 62.5%. The rate for 370 teens who appeared to be between 14 and 17 years old was a low 41.1%. The seatbelt use rate for occupants who appeared to be age 18 years and older was 63.9%. Comparable rates in the 2002 survey were 67.1% for children under 5, 55.2% for children 5 – 13, 48.0% for teens, and 61.6% for adults.

More right front seat passengers (65.0%) than drivers (62.5%) were wearing safety restraints. Seatbelt use also varied by vehicle type. Occupants of sport utility vehicles (68.9%) and cars (66.1%) were more likely to wear safety restraints than were occupants of vans and pickups (56.7%). Finally, it was found that a higher percentage of occupants of out-of-state vehicles (73.5%) wore safety restraints than did occupants of vehicles with South Dakota license plates (61.5%).

Introduction

Despite several years of nationwide efforts aimed at improving transportation safety, motor vehicle injuries and fatalities continue to be a persistent threat to public safety. Motor vehicle fatalities are the leading cause of death among children, adolescents and young adults in the United States (Cohn, Hernandez, Byrd, & Cortez, 2002). Seatbelt usage dramatically reduces the probability of being fatally injured in a motor vehicle crash (Cummings, 2002; Derrig et al., 2002). Seatbelt use has also been shown to significantly decrease the severity of injuries in a motor vehicle crash and in particular to decrease both the incidence and severity of potentially fatal closed head injuries (Norris, Matthews, Riad, 2000). According to the NHTSA, deaths and serious disabilities caused by motor vehicle crashes could be reduced by approximately 50% with the use of safety belts and child restraint devices.

Still, the public appears slow to catch on as nationwide seatbelt usage rates make modest but steady gains from 58% in 1994 to 75% in 2002 (NHTSA, 2002). Safety restraint usage by front seat motor vehicle occupants became mandatory in South Dakota on January 1, 1995 (DOT, 2002) and by 1996, 49 out of 50 states had some type of statewide legislation mandating safety restraint usage (Derrig, Segui-Gomez, Abtahi, & Liu, 2002). Yet, despite these mandates, a surprisingly large number of motor vehicle occupants continue to travel unrestrained, particularly in select population groups. Additionally alarming is the observation that younger drivers, the driver population most likely to be non-users of safety belts, are also more likely to engage in other high risk driving behaviors such as driving after drinking, tailgating, running red lights, and driving at excessive speeds (Wells, Williams, & Framer, 2002).

A recent report examining seatbelt use among high school students (Williams et al., 2003) found that teens have particularly low seat belt usage when riding as a passenger in cars driven by other teens. Yet, even when riding in a car driven by an adult, Williams and colleagues observed that over 40% were not belted.

Males have been found to have lower seatbelt usage rates as compared to females (Brooke et al., 2001; Wells et al., 2002; Williams, McCartt, & Geary, 2003). This gap may be narrowing as nationwide estimates for male seatbelt use increased from only 67% in 2000 to 72% in 2002 compared to rates of 77% and 79% for females in 2000 and 2002, respectively (Glassbrenner, 2003).

Rural communities face particular challenges in encouraging motorists to comply with seatbelt legislation. Nationwide, belt use in rural areas remains consistently below urban and suburban area rates. Male farmers are particularly negligent in restraint usage. In a recent investigation of injury risk factors conducted in rural Iowa, restraint usage rates for male farmers were found to be significantly less than those observed for male non-farmers. Usage rates by farm women did not differ from non-farm women (Zwerling et al., 2001).

Seatbelt usage rates have also been found to be significantly lower among lower socioeconomic status populations (Lerner et al., 2001; Wells et al., 2002) and among persons without college degrees (Wells et al., 2002), at least in states, such as South Dakota, without primary enforcement regulations.

These facts and figures emphasize the importance of safety restraint usage at the local level. In response to a national initiative by the NHTSA, the South Dakota Office of Highway Safety commissioned associates of the Human Factors Laboratory (HFL) at the University of South Dakota to conduct a probability-based survey of seatbelt use in the state in the fall of 1998. The annual survey was repeated in the fall of 2000, fall of 2001, summer of 2002, and currently during the summer of 2003. The purpose of these studies was to document the level of seatbelt use in a sample of drivers and front seat passengers traveling in noncommercial vehicles on South Dakota roads.

This report presents the methods, procedures and results of the 2003 Statewide Seatbelt Survey. The methods used in the 2003 study were based in large part on those established in the 1998 survey and used subsequently in the 2000, 2001, and 2002 surveys. Modifications were made in the 2000 survey design for collection of data on more child passengers. These modifications were again implemented in the 2001, 2002, and 2003 survey design. Methods and results of the 2003 survey are presented below, followed by a discussion of the general trends observed in usage rates, and implications for future surveys and public safety programming.

Methods

The methods used in this study were designed and conducted according to federal guidelines established by NHTSA and as implemented in the previous 1998 Statewide Seatbelt Survey. The methods and procedures described below are in compliance with the “Uniform Criteria for State Observational Surveys of Seat Belt Use”, published in the Federal Register on September 1, 1998 (63 F.R. 463389). The design was modified in the 2000 survey in an effort to increase the observational rate for children under the age of 5 years.

Survey Design: Stage 1

This study utilized the geographic sampling techniques and road segment sites established in the 1998 survey. The first step was to select geographic areas for sampling of traffic. South Dakota is a state with less than 800,000 citizens residing in 66 counties. The population is not evenly distributed throughout the state, as 50% of the citizens live in eight counties with urban centers. Many of the remaining 58 counties have low populations residing in largely rural areas.

Because it is difficult to sample traffic in all areas of a state with a low population, a “multi-stage cluster approach” was utilized. In this plan recommended by NHTSA guidelines, sampling can be restricted to the counties that account for 85% of the state’s population. Therefore, the sampling pool was comprised of the 33 largest counties in South

Dakota that account for 85% of South Dakota's population. Table 1 shows the eligible counties in ascending order according to population size.

Table 1: Largest South Dakota Counties Accounting for 85% of the State Population.

	County	Population	% of State	Cumulative %
1-33				14.44%
34	Dewey	5668	0.77%	15.21%
35	McCook	5686	0.77%	15.98%
36	Kingsbury	5830	0.79%	16.77%
37	Day	6421	0.87%	17.64%
38	Moody	6538	0.89%	18.53%
39	Tripp	6883	0.93%	19.46%
40	Custer	6966	0.94%	20.40%
41	Fall River	7123	0.97%	21.37%
42	Bon Homme	7677	1.04%	22.41%
43	Spink	7700	1.04%	23.45%
44	Grant	8048	1.09%	24.54%
45	Hutchinson	8102	1.10%	25.64%
46	Turner	8633	1.17%	26.81%
47	Butte	8926	1.21%	28.02%
48	Todd	9296	1.26%	29.28%
49	Charles Mix	9493	1.29%	30.57%
50	Roberts	9973	1.35%	31.92%
51	Lake	10,647	1.44%	33.36%
52	Union	11,959	1.62%	34.98%
53	Shannon	12,010	1.63%	36.61%
54	Clay	15,370	2.08%	38.69%
55	Hughes	15,404	2.09%	40.78%
56	Beadle	17,976	2.44%	43.22%
57	Davison	18,807	2.55%	45.77%
58	Lincoln	20,152	2.73%	48.50%
59	Yankton	21,013	2.85%	51.35%
60	Meade	21,999	2.98%	54.33%
61	Lawrence	22,131	3.00%	57.33%
62	Codington	25,452	3.45%	60.78%
63	Brookings	26,186	3.55%	64.33%
64	Brown	35,701	4.84%	69.17%
65	Pennington	87,190	11.81%	80.98%
66	Minnehaha	140,518	19.04%	100.00%
	TOTAL	7,379,733		

Following NHTSA guidelines, a sample of 13 counties could be drawn for a state with at least 85% of the population residing in 30 – 39 counties. The two largest counties in the state were selected and the remaining 11 counties were randomly drawn. Table 2 lists the counties that were selected and their corresponding populations.

Table 2: Selected Counties and Their Populations

County	Population
1. Minnehaha	140,518
2. Pennington	87,190
3. Brown	35,701
4. Lawrence	22,131
5. Davison	18,807
6. Beadle	17,976
7. Hughes	15,404
8. Union	11,959
9. Charles Mix	9493
10. Grant	8048
11. Fall River	7123
12. Tripp	6883
13. Kingsbury	5830

Although Hutchinson County was initially drawn for the sample, it was learned that the county would be undergoing a local seatbelt survey in the fall of 1998. Therefore, Tripp County was substituted.

Survey Design: Stage 2

The second stage of the study was to select the sample of road segments to be surveyed within the thirteen counties. According to NHTSA guidelines, road segments must be drawn from roads that have an adequate level of traffic based upon Vehicle Miles Traveled (VMT) estimates. Initially, it was estimated that there were an average number of 50 road segments available for sampling in the South Dakota counties. According to the NHTSA guidelines, 19 road segments can be sampled from a base of 50 road segments per county.

However, assessment of 1998 VMT estimates for South Dakota roadways revealed that only an average number of 27 road segments were available for sampling in the 13 counties. (Relative to other states, South Dakota has a limited number of roadways for which VMT estimates are recorded.) Therefore, permission was received from the regional survey design advisor to sample 17 or fewer road segments per county.

In order to select the road segments, maps of roadways and VMT estimates per roadway segments for the 13 counties were obtained from the South Dakota Department of Transportation, Division of Planning and Engineering. Roadways were divided into four classifications:

Urban Interstate

Urban Highway -- principal and minor highways within designated urban areas
(5,000 + population)

Rural Interstate

Rural Highways -- principal and minor highways outside of urban areas.

Following recommendations from the regional survey design advisor, road segments for urban interstate and urban highways were measured in one mile units, whereas road segments for rural interstate and rural highways were measured in ten mile units. VMT estimates were calculated for each road segment chosen. Road segments with unacceptably low VMT estimates were excluded. Once all of the roadways in a county were divided into eligible segments, a random numbers program was used to select 17 segments for sampling.

The random selection procedure was restricted by the roadway classification of a segment so that the number of segments chosen would be proportionate to the total VMT traveled on a roadway type for that county. For example, in Minnehaha County, the proportions of total vehicle miles traveled by roadway type were:

23% for Urban Interstate

43% for Urban Highways

25% for Rural Interstate

10% for Rural Highways.

Therefore, the drawing of selected road segments was restricted to:

4 Urban Interstate sites (about 23% of 17 sites)

7 Urban Highway sites (about 43% of 17 sites)

4 Rural Interstate sites (about 25% of 17 sites)

2 Rural Highway sites (about 10% of 17 sites).

The procedure described above was applied individually to the 13 counties for final selection of the 17 road segments. Five counties (Brown, Davison, Grant, Kingsbury, and Tripp) had only 13 to 16 road segments chosen because of a limited number of roadways with VMT data available.

The last step in the road segment selection process was to designate a seatbelt observation site within each of the 205 selected road segments. Whenever possible, the observation site was placed at an intersection in which vehicles slowed or stopped for a traffic signal or sign. This allowed for accurate and safe viewing of seatbelt use by the Observers. See Appendix A for a list of the observation sites by mile marker and probability of selection in counties by the four roadway types.

Sampling Time Periods

Six 90-minute blocks of daylight time were scheduled for seatbelt observations. One observation time period was 40 minutes. Including travel time, six sites could be observed in a single day. A county could therefore be surveyed in a four-day period. To minimize travel time and distance required to conduct the survey, sample sites were grouped into geographic clusters. A day of the week to begin data collection was assigned to a cluster. Within a cluster, each road segment was randomly assigned to the available time slots. The time blocks were:

- 1) 7:30AM - 9:00AM
- 2) 9:00AM - 10:30AM
- 3) 10:30AM - 12 noon
- 4) 12 noon - 1:30PM
- 5) 1:30PM - 3:00 PM
- 6) 3:00PM - 4:30PM

Sample Size

Based on previous observational surveys in South Dakota, it was estimated that approximately 10,000 vehicle observations would be collected from the 205 sites. This sample size allows one to be 95% confident that the numbers reported would be within 1% of the actual values -- an acceptable margin of error according to NHTSA guidelines.

Data Collection

For the 2000 survey, the 1998 data collection form was modified to reflect the inclusion of additional child passengers between 0-4 years of age. This modification was implemented in all subsequent surveys including 2001, 2002, and the current 2003 survey. A copy of this modified form is included on the last page of the Observer Manual in Appendix B. The data collection form was designed for recording seatbelt use (yes or no) by front seat drivers and right-side passengers of each vehicle observed in the survey. The modified form also included instructions for recording additional front seat passengers and back seat passengers who were under the age of five years.

The form allowed collection of other information of interest to the South Dakota Office of Highway Safety, including child restraint use for all passengers who appeared to be under age five, estimated age of drivers and passengers, vehicle type, and in- or out-of-state license plate of the vehicle. Demographic data were also collected for each vehicular observation period including county, site number, time of day, date, observer initials, and roadway type. Data were collected for all passenger cars, pickups, vans, and sport utility vehicles observed. Commercial trucks and motor homes were excluded.

Observers, Observation Procedures, and Observer Training

Two Observers were assigned to a county. Nearly all the Observers were members of a retired citizen group who have a background in driver education. Members of this group have been found to be accurate and motivated observers of seatbelt use in previous surveys. Observers received 1) a list of observation sites and a description and maps of the site locations for their respective counties, 2) a four-day schedule for completing a 40-minute observation period of each site in their county, 3) an instruction manual explaining how to conduct roadside observations, and 4) coding sheets for recording data. In addition, the Office of Highway Safety issued Observers safety vests and clipboards. Observers received training through a series of telephone conference calls with the HFL investigators. Observers were instructed to read the manual and engage in a practice period using local traffic. After the practice period, Observers received a final call from the investigators to review procedures.

Observers were instructed to follow their observation schedules as closely as possible. In the event that Observers could not complete a scheduled site due to weather or complications, they were instructed to call the HFL investigators for reassignment of that site. Observers were asked to stand or park in a safe viewing place when they reached an observation site. They were to station themselves so that they could view traffic traveling in a pre-designated direction on the pre-designated roadway. Observers were instructed to monitor every vehicle if the traffic flow was regular or light, and every other vehicle if the traffic flow was heavy. Observers monitored traffic for 40 minutes of the 90 minute observation period, and used the remaining minutes for travel time and location of a safe observation point.

The data collection procedures are explained in detail in the “Observer Manual – 2003 South Dakota Seatbelt Survey” in Appendix B.

Review of Data

Two graduate students in the Human Factors program at USD received University funding to review over 12,000 lines of raw data for unreadable writing, obvious errors, and logical inconsistencies in the coding (e.g., two drivers in a vehicle with the same ID number; a driver with an infant age). When possible, the coding was corrected. If there remained a question as to the validity of the coding, the line was discarded. Reviewers identified and corrected about 200 problem lines of data. They discarded about 20 observations.

Once data were encoded, investigator Carryl Baldwin reviewed the data again for logical errors in coding. She identified and discarded about 25 observations. In addition, she set aside 123 observations of additional persons in the back and front seat who were older than age 4.

Results

A total of 11,706 observations from the 13 selected counties are included in the analyses. A small percentage of observations could not be included in individual analyses due to missing data. Of the 11,706 motorists, 7402 or 63.2% were wearing shoulder safety restraints or were placed in a child restraint, while 4304 or 36.8% were not wearing safety restraints. Restraint use was coded “yes” if there was an observed presence of a shoulder harness. Using the presence of a shoulder strap to indicate seatbelt restraint usage has been demonstrated in previous research to result in the highest accuracy rate as compared to other existing methods. Child restraint use was coded “yes” if a child was seated in a restrained child safety seat regardless of whether or not a shoulder restraint securing the child safety seat was in view.

Estimate of Statewide Seatbelt Use

The statewide estimate of seatbelt use was obtained by finding the percentage of seatbelt use for each of the 205 sites, and then computing a weighted mean for each road type for each county. Then, a weighted average for each road type across counties was found where the weights were the VMT (vehicle miles traveled) for that county on that road type and the sampling weight for the county based on the probability of its selection to be included in the survey. Finally, the estimates for the four road type averages were weighted by the VMT for each road type for the entire state. ***The resulting estimate for seatbelt use on all South Dakota roads was 69.9% with a standard error of 0.538.*** Thus, it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota roads ranges between 68.9% and 71.0%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix C.

The 2003 statewide estimate is approximately 6.7% higher than the 2002 rate. This difference is statistically significant. Thus one can say with 95% confidence that the 2003 statewide restraint use is higher than the 2002 statewide restraint use.

Estimate of Statewide Seatbelt Use by Road Type

The 2003 weighted statewide estimates for seatbelt use by road type were 68.6% for urban highways, 61.2% for rural highways, 75.9% for urban interstates, and 82.2% for rural interstates. The corresponding 2002 weighted statewide estimates for seatbelt use were 60.0% for urban highways, 56.5% for rural highways, 75.7% for urban interstates, and 74.8% for rural interstates. Given the confidence bounds on these rates of +/- less than 1%, one can conclude that usage rates increased significantly on urban highways, decreased slightly for rural highways, stayed about the same for urban interstates, and increased significantly for rural interstates.

Seatbelt Restraint Use by County

Table 3 presents a summary of unweighted data regarding overall seatbelt restraint use in each county as well as the total number of observations per county. Several counties had seatbelt use rates above the National average of 75% observed in the National Occupant Protection Use Survey in 2002 (NHTSA, 2002). The highest 2003 usage rate for South Dakota was observed in Minnehaha County where 80.4% or 766 of the 953 motorists observed were wearing safety restraints. This rate is substantially higher than the rate of 68.7% rate observed in Minnehaha County in the 2002 Survey. The next highest usage rate was observed in Union County with 77.0% or 339 of 440 motorists wearing a safety belt or restraint. Hughes had a usage rate of 75.8% or 1097 of 1448. Both counties experienced an increase in usage rates relative to the 2002 survey (70.9% for Union County and 61.9 for Hughes County.)

Table 3: Restraint Use by County

County	Restraint Used		Total
	Yes	No	
Minnehaha	766 80.4%	187 19.6%	953
Pennington	911 67%	448 33%	1359
Brown	710 64.9%	382 35.1%	1094
Lawrence	923 72.7%	347 27.3%	1270
Davison	609 59.6%	412 40.4%	1021
Beadle	683 55.4%	550 44.6%	1233
Hughes	1097 75.8%	351 24.2%	1448
Union	339 77.0%	101 23.0%	440
Charles Mix	275 48.1%	297 51.9%	572
Grant	352 45.0%	431 55.0%	783
Fall River	211 60.1%	140 39.9%	351
Tripp	152 36.8%	261 63.2%	413
Kingsbury	374 48.6%	395 51.4%	769
Total	7402	4304	11,706
% of Total	63.2%	36.8%	

Several other South Dakota counties showed upward trends in seatbelt usage. Lawrence County had a usage rate of 72.7% or 923 out of 1270 motorists. This rate was substantially higher than the 54.1% rate observed in the 2002 survey. Pennington County witnessed a modest increase with a 2003 observed rate of 67.0% (911 of 1359 motorists) as compared to a rate of 63.3% in 2002. Seatbelt use in Brown County rose to 64.9% (710 of 1094 motorists) in the current survey from a rate of 56.1% observed in the 2002 survey. Charles Mix County had a 2003 rate of 48.1% (275 of 572 motorists), up from 41.2% in 2002. Kingsbury County had a slight increase to 48.6% (374 of 769 motorists) from the 2002 rate of 45.7%.

Four counties had lower rates of seatbelt use in 2003 as compared to 2002. Davison County had an observed rate of 59.6% (609 of 1021 motorists), a substantial drop from the 76.2% rate observed in 2002. In Grant County, the 2003 rate of 45% (352 of 783 motorists) was much lower than the 2002 rate of 65.9%. The 2003 rate for Beadle County was 55.4% (683 of 1233 motorists), which was lower than the 62.5% rate in 2002. In Tripp County, the 2003 rate of 36.8% (152 of 413 motorists) was lower than the rate of 46.8% observed in 2002.

One county showed no change between the 2003 and 2002 surveys. Fall River County had an observed rate of 60.1% (211 of 351 motorists), compared to a rate of 61.5% observed in 2002.

In summary, 8 out of 13 counties showed an increase in seatbelt use rates from the 2002 to the 2003 survey periods. Though these increases were modest in some cases, they follow a nationwide trend towards steadily increasing seatbelt use among motorists in general.

Age of Motorist

Observers estimated the age of drivers and passengers to the best of their ability. If the observer was unable to determine age, these few instances were excluded from the age by restraint use analyses. As in all previous surveys since 1998, Observers always recorded data for the driver and a right front passenger, irrespective of age. In subsequent years (2000, 2001, 2002 and the present 2003 surveys), data were also recorded for additional passengers between 0-4 years of age present in the front seat (e.g., on the right front passenger's lap or in the middle of the seat). Data were also recorded for any child between 0-4 years of age riding in the back seat. This new protocol was adopted to increase the sample size of child passengers age 0-4 years for better estimates of child restraint use.

Due to a misunderstanding of instructions, some of the Observers in 2003 recorded seatbelt/restraint usage for any person under the age of 18 observed riding in the middle or back seat passenger positions. Since these data did not follow the prescribe protocol, they were not included in any of the overall analysis. However, since the data represented actual cases and included a substantial number of youths aged 14 to 17, the data were analyzed and reported separately in Appendix D.

Child restraint use was defined as a passenger restrained by a child carrier. If children under the age of 5 years were observed riding in the front or back seat of a vehicle unrestrained, this was recorded as no restraint used. If a child under five years of age was observed riding in the front or back seat wearing a shoulder restraint but not seated in a child carrier, then restraint use was recorded as a “yes”. Note however, that according to South Dakota law, all children under the age of 5 years should be restrained in an approved child safety restraint unless they weigh more than 40 pounds. Table 4 illustrates the total number of observations and restraint use by each age group including the use of child restraints.

Table 4: Restraint Use by Age

Age	Restraint Use			Total
	Belt	Child Restraint	None	
0 - 4 years	27 33.4%	30 37.0%	24 29.6%	81
5 -13 years	60 62.5%		36 37.5%	96
14 - 17 years	152 41.1%		218 58.9%	370
18 & over	7123 63.9%		4020 36.1%	11,143
Total	7362 63.0%	30 0.25%	4298 36.8%	11,690

A total of 81 children between 0-4 years of age were observed. Of these, a total of 70.4% were observed in some type of safety restraint: 37% (30/81) buckled in a child safety restraint and 33.4% (27/81) were wearing a shoulder restraint, but not seated in a child safety seat. The remaining 29.6% (24/81) were not wearing any type of safety restraint.

These rates are up slightly from the rates observed in the 2002 survey where an overall restraint use rate of 67.1% was observed for children under the age of 5 with 35.4% (29/82) buckled in a child safety restraint and 31.7% (26/82) wearing a shoulder restraint, but not seated in a child safety seat. The remaining 32.9% (27/82) were not wearing any type of safety restraint.

A total of 96 children between 5-13 years of age were observed. Of these, 60 or 62.5% were wearing a seatbelt. This compares to a rate of 53.4% (62/116) observed in the 2002 survey. The 2003 rate was still lower than the 64.5% usage rate for 5-13 year olds observed in the 2001 survey.

A total of 370 motorists were estimated to be the teen-age category of 14 to 17 years. Of these, 152 or 41.1% were wearing a safety restraint. This rate is down slightly from the rate of 48.0% (203/429) observed in the 2002 survey.

The majority of observed motorists (a total of 11,143) were estimated to be in the age group of 18 years and older. Of these, 7123 (63.9%) were wearing a restraint. The adult rate represents a modest but steadily increasing usage rate over the survey years. In 2002, the observed rate was 61.6%, the 2001 rate was 56.5%, and the 2000 rate was 53.2% for the adult age group.

Drivers versus Passengers

According to guidelines, data were recorded for all drivers and right front seat passengers. Data for additional passengers were only recorded if the additional passenger was under the age of 5 years (0-4 years).

Unweighted data for restraint use by occupant position in the vehicle are presented in Table 5. Restraint use was somewhat higher for passengers than for drivers. Of the 8,981 drivers observed, 5616 or 62.5% were wearing a safety restraint. This compares to a rate of 59.9% in the 2002 survey. Of the 2,680 right front seat passengers observed, 1742 or 65% were wearing shoulder restraints, with an additional 8 or .3% in a child safety seat.

According to federal and state guidelines, children 0-4 years of age should be placed in a child safety restraint in the back seat, where possible. As indicated in Table 5, over 90% (28/31) of the 0-4 year age children seated in the back seat were in fact observed in some type of safety restraint. This rate is up substantially from the rate of 78.6% (22/28) observed in the 2002 survey. The rate of children age 0-4 placed in a child restraint is still low at 58.1% or 18 of 31. However, this rate represents a modest increase from the 2002 survey where only 50.0% were in a child restraint.

Data from 16 additional child front seat passengers were recorded. Of these 16, 10 (62.5%) were wearing some type of safety restraint, with 4 (25%) observed to be in a child safety seat and the remaining 6 (37.5%) were not using any type of restraint. This overall restraint rate of 62.5% again represents an increase from the rate of 55% observed in the 2002 survey. Due to the low number of observations for children under 5 years observed in the additional front seat and back seat positions, the comparisons of seatbelt use rates between 2002 and 2003 may not be reliable.

Table 5: Restraint Use for Drivers versus Passengers.

Occupant Type	Restraint Use			Total
	Yes	Child Restraint	None	
Drivers	5616 62.5%		3365 37.5%	8981
Right-Front Passengers	1742 65.0%	8 .3%	930 34.7%	2680
Additional Child Front Passenger	6 37.5%	4 25.0%	6 37.5%	16
Child Passenger Back Seat	10 32.3%	18 58.1	3 9.7%	31
Total	7374 63.0%	30 .26%	4304 36.8%	11,708

Vehicle Type

Only non-commercial vehicles were observed. Vehicles were categorized into three classifications: cars; vans, mini-vans, pickups and station wagons; and Sport Utility Vehicles (SUVs). Table 6 presents a summary of data regarding restraint use in each vehicle category. The ratio of restraints worn per motorist is considerably higher in categories of cars (66.1%) and Sport Utility Vehicles (68.9%) than the rate observed for vans/pickups (56.7%). This pattern of rates is consistent with the rates observed in the 1998, 2000, 2001 and 2002 surveys.

Table 6: Restraint Use by Vehicle Type

Vehicle Type	Restraint Use			Total
	Yes	Child Restraint	None	
Cars	3654 66.1%	17 .3%	1854 33.6%	5525
Vans/Pickups	2512 56.7%	7 .2%	1911 43.1%	4430
SUVs	1203 68.9%	6 .3%	538 30.8%	1747
Total	7369 63.0%	30 .26%	4303 36.8%	11,702

In-State versus Out-of-State Vehicles

Observers recorded whether or not the vehicles included in the observation had in or out-of-state license plates. The overwhelming majority of observations were of vehicles with in-state license plates (87.7% or 10,224 out of 11,660). As illustrated in Table 7, vehicles with out-of-state license plates tended to have higher rates of seatbelt restraint use (73.5%) than did motorists traveling in vehicles with in-state license plates (61.5%).

Table 7: Restraint Usage Observed for In- and Out-of State License Plates

License Plates	Restraint Use			Total
	Yes	Child Restraint	None	
In-State	6292 61.5%	25 .2%	3907 38.2%	10,224
Out-of-State	1056 73.5%	5 .3%	375 26.1%	1,436
Total	7348 63.0%	30 .25%	4282 36.7%	11,660

Observer Reliability Check

A reliability check of observer seatbelt coding was conducted in Minnehaha County in the 2003 survey. One week after actual survey period, a new Observer team recorded data at 10 of 17 seatbelt sites in Minnehaha County.

A series of X^2 tests were conducted to test the seatbelt use rates observed by the two different Observer teams at the 10 sites. The site by site comparison revealed that eight of the ten sites had seatbelt use rates that were statistically equivalent. For example, at site 14, the regular Observers found a 74% use rate for 91 vehicles, whereas the validity check Observers found a 68.2% rate for 107 vehicles. However, the validity check Observers consistency found lower seatbelt use rates for nearly every site.

Discussion

Results of the current survey established that the weighted, statewide estimate of restraint use for South Dakota in year 2003 was 69.9%. This weighted, statewide estimate is statistically significantly higher than the 2002 rate of 64.0% and the 2001 statewide estimate of 63.3%. The 2002 and 2001 rates did not differ significantly. The significantly higher restraint use for 2003 represents a return to the significant upward trend experience from the weighted, statewide estimates of 45% in 1998 and 53.4% in 2000.

Despite the demonstrated positive upward trend in South Dakota seat belt usage, overall statewide rates still fall somewhat below the national average. Nationwide seatbelt use rates have been rising steadily from 68% in 1996, 68.9% in 1998, 71% in 2000, 73% in 2001 and 75% in 2002 according to NHTSA records.

Child Restraint Use

Nationwide, the leading cause of death and disability for children over the age of one year is motor vehicle accidents (Cohn et al., 2002; Winston, Durbin, Kallan, & Moll, 2000). According to NHTSA figures, most children killed in automobile accidents are not restrained. It is estimated that in an automobile accident, rear-facing infant seats reduce the risk of fatal injury for young children by as much as 71%, while seatbelts reduce the risk of fatal injury for young children by only 45% (NHTSA, 2001). Despite these figures, many children continue to travel in motor vehicles without adequate safety restraints. The rate observed in the current 2003 survey (70.4% in some type of restraint) represents a modest increase from the 2002 rate of 67.1%. The 2003 rate still remains considerably below the national average of 94% observed in the 2002 nationwide survey (NHTSA, 2003).

Recommendations for Future Surveys

As stated in previous reports, the investigators would like to consider ways in the future to increase the number of observations of passengers below the age of 18. This year, some Observers accidentally provided us with data on older children and teens in the center front or back seat positions. We think that these data are useful and included an additional analysis of seatbelt use by these young riders. In the future, we should consider instructing Observers to collect seatbelt use data on all non-adult passengers in the center front and back seat in order to estimate the level of protection of this vulnerable population.

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Appendix A

List of Observation Sites by Roadway Type

Urban Interstate

County	Road	Mile	Site #	Probability of Selection for County
Minnehaha	29N	77	2	.31
Minnehaha	29N	98	3	.31
Minnehaha	229	3	4	.31
Minnehaha	229	5	5	.31
Minnehaha	229	7	6	.31
Pennington	90E	56	11	.18
Pennington	90E	60	12	.18
Lawrence	90	13	2	1.00
Davison	90	330	8	1.00
Davison	90	333	10	1.00
Union	29S	.98	1	1.00

Rural Interstate

Minnehaha	90	379	13	.19
Minnehaha	90	390	14	.19
Minnehaha	90	412	15	.19
Pennington	90E	66	13	.31
Pennington	90E	90	14	.31
Pennington	90E	98	15	.31
Pennington	90W	55	16	.31
Pennington	90W	62	17	.31
Lawrence	90	12	1	1.00
Lawrence	90E	15	3	1.00
Lawrence	90E	27	4	1.00
Lawrence	90W	12	5	1.00
Lawrence	90W	15	6	1.00
Lawrence	90W	24	7	1.00
Davison	90	319	6	1.00
Davison	90	325	7	1.00
Davison	90	332	9	1.00
Union	29N	1	2	1.00
Union	29N	18	3	1.00
Union	29N	27	4	1.00
Union	29S	42	5	1.00
Grant	29	201	16	1.00

Urban Highway

Minnehaha	115	84	7	.70
Minnehaha	115	87	8	.70
Minnehaha	115	88	9	.70
Minnehaha	11	79	10	.70
Minnehaha	42	363	11	.70
Minnehaha	42	367	12	.70
Minnehaha	38	365	17	.70
Pennington	16	69	2	.18
Pennington	16B	68	3	.18
Pennington	16B	70	4	.18
Pennington	79	80	6	.18
Pennington	44	40	7	.18
Pennington	44	49	8	.18
Brown	12	289	4	1.00
Brown	12	290	5	1.00
Brown	12	292	6	1.00
Brown	12E	289	8	1.00
Brown	281	193	9	1.00
Brown	281N	197	14	1.00
Lawrence	14A	9	14	.13
Lawrence	14A	10	15	.13
Davison	37	74	3	.60
Davison	37	76	4	.60
Davison	38	300	12	.60
Beadle	37	125	13	1.00
Beadle	37	127	14	1.00
Beadle	37	128	15	1.00
Hughes	14E	230	3	1.00
Hughes	14W	232	5	1.00
Hughes	14	229	6	1.00
Hughes	14	230	7	1.00
Hughes	14B	95	11	1.00
Hughes	14B	96	12	1.00
Hughes	34	209	13	1.00
Hughes	34	210	14	1.00

Rural Highway

Minnehaha	19	64	1	.07
Minnehaha	38	349	16	.07
Pennington	16	45	1	.10
Pennington	16A	59	5	.10
Pennington	44	87	9	.10
Pennington	44	107	10	.10
Lawrence	385	122	8	.66

Lawrence	85	28	9	.66
Lawrence	14A	29	10	.66
Lawrence	14A	35	11	.66
Lawrence	14A	37	12	.66
Lawrence	14A	41	13	.66
Lawrence	14A	41	16	.66
Lawrence	14A	50	17	.66
Brown	10	279	1	.55
Brown	10	282	2	.55
Brown	10	297	3	.55
Brown	12	309	7	.55
Brown	281	214	10	.55
Brown	281	214	11	.55
Brown	281S	185	12	.55
Brown	281N	185	13	.55
Brown	37	207	15	.55
Brown	37	208	16	.55
Brown	37	208	17	.55
Hughes	83	138	1	.69
Hughes	1804	256	2	.69
Hughes	14	139	4	.69
Hughes	14	246	8	.69
Hughes	14	251	9	.69
Hughes	14	263	10	.69
Hughes	34	212	15	.69
Hughes	34	232	16	.69
Hughes	34	245	17	.69
Davison	37	62	1	.83
Davison	37	72	2	.83
Davison	37	76	5	.83
Davison	42	302	11	.83
Davison	38	302	13	.83
Beadle	14	333	1	.83
Beadle	14	354	2	.83
Beadle	14	354	3	.83
Beadle	14	363	4	.83
Beadle	14	316	5	.83
Beadle	14	326	6	.83
Beadle	14	326	7	.83
Beadle	14	331	8	.83
Beadle	28	269	9	.83
Beadle	28	283	10	.83
Beadle	28	298	11	.83
Beadle	281	117	12	.83
Beadle	37	133	16	.83
Beadle	37	145	17	.83
Union	46	365	6	.88

Union	46	366	7	.88
Union	46	380	8	.88
Union	46	371	9	.88
Union	11	9	10	.88
Union	11	23	11	.88
Union	11	35	12	.88
Union	11	35	13	.88
Union	50	423	14	.88
Charles Mix	50	337	1	.88
Charles Mix	50	329	2	.88
Charles Mix	50	314	3	.88
Charles Mix	50S	299	4	.88
Charles Mix	50N	299	5	.88
Charles Mix	50	273	6	.88
Charles Mix	1804	90	7	.88
Charles Mix	1804	120	8	.88
Charles Mix	44	298	9	.88
Charles Mix	44	305	10	.88
Charles Mix	44	306	11	.88
Charles Mix	45	27	12	.88
Charles Mix	46	277	13	.88
Charles Mix	46	288	14	.88
Charles Mix	46	290	15	.88
Grant	20	439	1	1.00
Grant	20	439	2	1.00
Grant	20	446	3	1.00
Grant	158	439	4	1.00
Grant	12	377	5	1.00
Grant	12	388	6	1.00
Grant	12	390	7	1.00
Grant	12	390	8	1.00
Grant	12	399	9	1.00
Grant	123	172	10	1.00
Grant	15	160	11	1.00
Grant	15	167	12	1.00
Grant	15	174	13	1.00
Grant	15	174	14	1.00
Grant	15	175	15	1.00
Fall River	18	62	1	.65
Fall River	18	11	2	.65
Fall River	18	12	3	.65
Fall River	18	24	4	.65
Fall River	471	7	5	.65
Fall River	471	21	6	.65
Fall River	471	27	7	.65
Fall River	89	29	8	.65
Fall River	71	1	9	.65

Fall River	71	2	10	.65
Fall River	71	7	11	.65
Fall River	71	27	12	.65
Fall River	71	35	13	.65
Fall River	385	39	14	.65
Fall River	79	26	15	.65
Fall River	385	12	16	.65
Fall River	385	13	17	.65
Tripp	53	26	1	1.00
Tripp	183S	5	2	1.00
Tripp	183S	19	3	1.00
Tripp	183N	43	4	1.00
Tripp	183N	61	5	1.00
Tripp	49	18	6	1.00
Tripp	49	27	7	1.00
Tripp	49	42	8	1.00
Tripp	18	242	9	1.00
Tripp	18	252	10	1.00
Tripp	18	252	11	1.00
Tripp	18	273	12	1.00
Tripp	44	237	13	1.00
Tripp	44	270	14	1.00
Kingsbury	25	114	1	1.00
Kingsbury	25	120	2	1.00
Kingsbury	81	116	3	1.00
Kingsbury	81	119	4	1.00
Kingsbury	81	125	5	1.00
Kingsbury	14	363	6	1.00
Kingsbury	14	365	7	1.00
Kingsbury	14	378	8	1.00
Kingsbury	14	378	9	1.00
Kingsbury	14	383	10	1.00
Kingsbury	14	387	11	1.00
Kingsbury	14	390	12	1.00
Kingsbury	14	400	13	1.00
Kingsbury	25	113	14	1.00

Appendix B

Observer Manual – 2003 South Dakota Seatbelt Survey

Place holder for manual

Appendix C

Computatation of Mean Seat Belt Use for South Dakota

The computation of the mean seatbelt use for in South Dakota was a three-stage process. Stage 1 consisted of computing mean seat belt use for each road type in each county. For purposes of this calculation, only drivers and right front seat passengers were considered to retain compatibility to 1998 values and Federal reporting requirements. In this computation, the vehicle miles traveled value (VMT) for a particular site was computed by averaging the VMT values for each of the subsegments in the road segment the selected site represented. These VMT values were then used to compute a weighted average for all sites for a particular road type in a particular county. This weighted mean seatbelt use rate for a particular road type in a particular county is designated

\hat{P}_{ij} where i denotes road type (from 1 to 4) and j denotes county (from 1 to 13).

The second stage of the computation consisted of computing weighted means for each road type across counties based on the vehicle miles traveled (VMT) on that road type in each county and on the sampling weight for the county based on probability of selection for surveying for that county. The mean seatbelt use for a road type is

$$\hat{P}_i = \frac{\sum_{j=1}^{13} W_{.j} V_{ij} \hat{P}_{ij}}{\sum_{j=1}^{13} W_{.j} V_{ij}}$$

Where \hat{P}_i = the seat belt use estimate for road type i

$W_{.j}$ is the county weight for county j (1 for Minnehaha and Pennington, 31/11 for the remaining 11 counties)

V_{ij} is the VMT for road type i in county j

\hat{P}_{ij} is the seatbelt use rate estimated for road type i and county j in stage 1.

The final stage of the estimate consisted of computing the weighted average of the across county road type estimates for a statewide estimate. Weights were based on the proportion of the state's VMT on each road type.

The formula for computing the statewide estimate is

$$\hat{P} = \frac{\sum_{i=1}^4 V_i \hat{P}_i}{\sum_{i=1}^4 V_i}$$

Where \hat{P} = the statewide seat belt use estimate

V_i is the proportion of VMT for road type i in the state

\hat{P}_i is the rate estimated for road type i in the state stage 2.

In the 2002 South Dakota Survey, the following values were obtained

Urban Highway:	$w_1 = 0.18323$	$\hat{P}_1 = 68.64$
Rural Highway:	$w_2 = 0.44819$	$\hat{P}_2 = 61.16$
Urban interstate:	$w_3 = 0.05521$	$\hat{P}_3 = 75.94$
Rural interstate:	$w_4 = 0.31336$	$\hat{P}_4 = 82.21$

Thus, statewide seat belt use is estimated as **69.9%**.

Computation of Variance and Confidence Bounds for Mean Seat Belt Use for South Dakota

Computational formula for the variance of \hat{P} , using the terms as defined in the computation of the weighted use estimate above, is

$$Var(\hat{P}) = \frac{\sum_{i=1}^4 \sum_{j=1}^{13} (W'_{ij})^2 * (\hat{P}_{ij} - \hat{P})^2}{n^* - 1}$$

where n^* = the number of county-road type groups

The W'_{ij} in the formula are weights applied to the deviations based on the formula below

$$W'_{ij} = \frac{W_{.j} * V_{ij}}{\sum_{i=1}^4 \sum_{j=1}^{13} W_{.j} W_{ij}}$$

where the W 's and V in the formula are as define previously in discussion of the second stage of the analysis.

Using these formulas, the variance of \hat{P} is 0.289. The sampling error is then 0.538%.

Now, the 95% confidence bounds can be computed as the:

$$(\text{statewide mean}) \pm (1.96)(0.387).$$

Thus, the 95% confidence bounds on our mean estimate are:

$$69.94 \pm (1.96)(0.387) \text{ or } p(68.89\% < \text{Statewide Use} < 71.00\%) = .95$$

Appendix D: Additional Analyses

Children Aged 5 to 17 in the Middle Front or Back Seat Passenger Positions

As previously mentioned, due to an inadvertent misunderstanding data from all children under the age of 18 were recorded in the front middle and back seat passenger positions in some instances. These instances primarily occurred in Beadle (68 of 123) and Davison (16 of 123) Counties. Because this data was not specified in the design it was not included in any of the previous analyses in the 2003 survey report. However, since the data both represents actual observed cases and specifically represents an age group of interest that tends to be under-represented in the statewide survey, a decision was made to include an additional analysis to examine this data. As indicated in Table 7, a total of 123 additional motorists were observed in the two age categories of 5-13 years and 14-17 years. For the age group of 5-13 years, 67.7% (65 of 96) were observed wearing a seatbelt. For the age group 14-17 years, 59.3% were wearing seatbelts. These observed rates, mirror trends observed in both the current 2003 South Dakota survey and the National survey (NHTSA, 2002). Specifically, usage rates tend to be lower in the 14-17 age category relative to the 5-13 age category and lower in general compared to overall rates observed in the total population of all age groups.

Table 7: Restraint Use by Age for Additional Middle Front and Back Seat Passengers

Age	Restraint Used		
	Yes	No	Total
5 -13 years	65 67.7%	31 32.3%	96
14 - 17 years	16 59.3%	11 40.7%	27
Total	81 65.9%	42 34.1%	123